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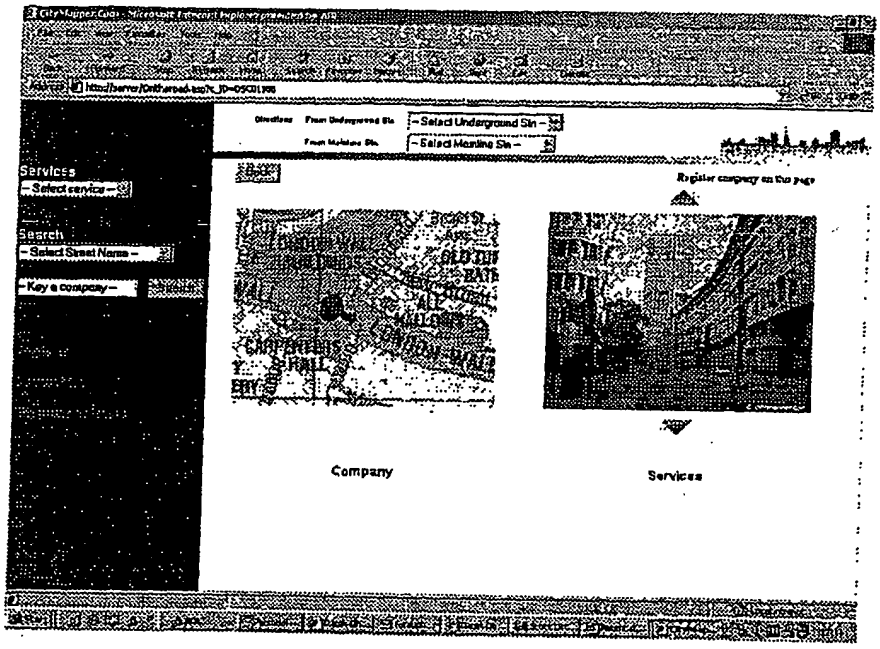
For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: NAVIGATION SYSTEM



(57) Abstract: A navigation system includes a portable user unit, such as a portable telephone, portable computer or similar device, having a display on which is displayed in addition to a map a three dimensional visual indication of the view the user would expect to see from a particular position. That position could be determined by a GPS receiver in the user unit. As the user travels the three dimensional view is updated, either automatically or by the user. Landmark information could also be provided.

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NAVIGATION SYSTEM

The present invention relates to a navigation system, such as a map.

The problems of navigation, particularly in built up areas, are well known. People have difficulties reading maps, correlating the representations on maps with the actual scenery around them and so on. Moreover, the level of detail in a map is normally much less than that required to reach one's intended destination. In particular, a user needs to understand either his/her immediate surroundings or locality or to be able to extrapolate from a map. This causes navigation difficulties for many people.

The present invention seeks to provide an improved navigation system.

According to an aspect of the present invention, there is provided a navigation system including a user device comprising a display, user input means for inputting data representative of a location co-ordinate and display generating means operable to generate on the display a three dimensional view of the environment indicated by inputted data.

Advantageously, the display generating means is operable to generate on the display a map or plan in addition to the three dimensional view. The map or plan may be displayed at the same time as the three dimensional view or separately therefrom. In the latter case, the system preferably provides the option, via a user input, of being able to toggle between the two views.

In the case of a plan, this may be a street plan or a floor layout of a building such as a museum or house.

The display generating means is preferably also able to display data relating to addresses or other locations of interest of desired destination and/or landmarks. Landmarks may include buildings, retail establishments and the like.

The three dimensional view is preferably in the form of a photograph or photograph-like image. However, the system could in addition or in the alternative provide three

dimensional line drawings (perspective views) depending upon memory and display capacities.

The system preferably also provides an orientation device, such as a Global Positioning Satellite (GPS) user unit, and means to indicate on the display position and/or direction of travel. Such indication can be by display of an appropriate three dimensional view and/or by an indication on a generated map, such as by an arrow.

The system is preferably designed to provide written and/or oral directions.

The navigation system is preferably also provided with a remote base unit at which map ~~and/or view data is stored for transfer to the user device. In this manner, the user device~~ need not have a large memory for storing a large number of views and maps. The base unit can transfer the appropriate views and maps in accordance with the user's needs and requests.

In the preferred embodiment, communication between the user device and the base unit is via a standard communications system such as a cellular telephone system, radio signal, satellite communication and the like. Advantageously, the system is incorporated into a portable telephone or in a navigation system in a vehicle. It is also envisaged that the user device could be a personal computer and that the communication system could be via the Internet. The computer could be portable but not necessarily so.

By this system, the user can obtain a view of his/her intended location and route. In the preferred embodiment, this is correlated with a map to show where the user is in relation to other landmarks and the user's desired destination or path. There is no need to be able to read maps accurately. Moreover, it is possible with the three dimensional views, particularly when in the form of photographs, to give far more visual cues than is possible with a map, thus facilitating orientation. The system could be thought of as providing a virtual view which can be correlated to the physical surroundings.

In the preferred embodiment, the user is provided with the ability to travel 'virtually' to a location by navigating through a series of digital photographs taken at street-level from the first-person perspective. The information presented in this way directly represents the 'user experience' and, unlike reading a street-map, requires no further translation.

An embodiment of the present invention is described below, by way of example only, with reference to the accompanying drawings, in which:

Figures 1a and 1b show an embodiment of double display with direction of travel indication and with view changes in the direction of travel;

~~Figures 2a and 2b show an embodiment of double display with direction of travel~~ indication and with view changes in a direction of travel opposite to that o Figures 1a and 1b;

Figures 3a and 3b show an embodiment of displays with direction of travel indication and landmarks; and

Figures 4a and 4b show an embodiment of displays with landmarks and written directions.

The following description focuses on the display features of the invention. The apparatus for implementing the system can be readily derived by the skilled reader. Indeed, it is possible to implement the system with simple modification of existing equipment, both at the user end and at the base system.

In the preferred embodiment, the presentation format on a user display shows a digital photograph alongside the corresponding street-map of the same location with an arrow representing the direction the 'viewer' is facing. By clicking on direction arrows or by other analogous input, the user can navigate the region, being then presented with the corresponding next photograph and street-map information. For example, when viewing a photograph showing a road that continues ahead of the viewer, clicking the 'South' direction button would emulate turning around 180° to show the view in the opposite

direction. Similarly, clicking the 'North' direction button would simulate walking down the road and present a new digital photograph showing a view taken further along the road.

From any given photograph, directions can be obtained to reach this destination from various starting points. The directions are preferably presented in a step-through set of text instructions, each one accompanied by a corresponding photograph relating to the surroundings of the given instruction.

This system can be implemented on hand-held devices such as a Palm Pilot(TM), as well as WAP portable telephones. The presentation format on a telephone is likely to differ slightly from that which can be presented on a personal computer (or Web Browser) but the principle of 'virtual walking' by navigating digital photographs is substantially the same. Of course, with a telephone, there are at present limitations as to display size and quality and transmission rates.

Example 1 ('Virtual Walking')

The screenshot of Figures 1a and 1b show the view from a specific point along London Wall in the City of London. The photo is accompanied by an A-Z format street map graphic showing the same location, together with a pointer showing the direction the user is facing. The arrows around the photograph represent possible directions in which the user can 'walk'.

By activating the top direction arrow (that is, straight ahead) the view changes to the screenshot of Figure 1b, which shows a photograph from further along the road, together with the corresponding street-map graphic.

Example 2 ('Virtual Walking')

In the example of Figures 2a and 2b, which represent the same starting point, the lower direction arrow is activated (representing a 180° turn-around by the user) to reveal the screenshot of Figure 2a, which shows the view in the opposite direction.

Example 3 ('Displaying Landmarks')

Below the photograph are provided a plurality of icons which name landmarks that are visible in the region depicted by the photograph (in this example the landmarks are shops). By positioning a mouse pointer provided on the display over the name, the exact location on the photograph is highlighted with a yellow spot (in Figure 3a screenshot the mouse has been placed over the 'Clarks' button). Clicking the name button will display a page of information about that particular landmark, as shown in the screenshot of Figure 3b.

Example 4 ('Directions')

Referring to Figures 4a and 4b, from either the 'landmark information' view or the 'street walking' view it is possible to request directions to reach this location from predetermined starting points (in the example shown the starting points are the nearest Underground or metro station, or one of three mainline stations: in this example, Liverpool St, Fenchurch St, and Cannon St).

The directions are displayed in a step-by-step sequence, with each instruction being accompanied by a photograph of the view at that particular location, as shown in the screenshot of Figure 4b.

It will be apparent that an implemented system could provide one or more of the above facilities, it being preferred that all these facilities are provided. As mentioned above, the various screenshots can be shown together, as depicted in each Figure, or separately with a toggle function if there are display limitations.

In the preferred embodiment, the displays as shown in Figures 1 to 4 are provided on a user device such as a computer, palm size computer or telephone.

In its simplest form, the user device provides for user entry of position and orientation and manual user adjustment of position during travel. However, in the preferred embodiment, the user device includes a GPS positioning unit which can provide automatic location, orientation and movement such that the map and views are automatically updated.

The data is preferably held by and transmitted from a base unit. In practice, the base unit will provide a database of maps and digital photographs and means to transmit the data to the user device upon receipt of appropriate requests from the user device. The specific design and components required for the base unit will be readily apparent to the skilled person.

The principal features of the preferred embodiment of base unit are outlined below.

The web pages that facilitate the 'virtual walking' experience, as well as those giving directions and landmark information, are constructed 'on-the-fly' by programming code (for example .asp) reading a database. This is opposed to creating code manually for each individual page.

The database of the preferred embodiment includes three linked tables or databases:

Table 1 relates to the directions.

Each record contains:

A unique identifier

The photograph graphic name

The text direction instruction

Table 2 relates to the 'virtual walking' display.

Each record contains:

The photograph graphic name (which is also a unique identifier)

One field for each direction (Ahead, Reverse, North, North East etc.)

15 fields for each starting location for directions – each field is a pointer to a Table 1 record, when output in the sequence keyed in the Table 2 record they will consist of the appropriate step-by-step directions

The corresponding street-map graphic name

20 groups of three fields relating to the landmark information:

One field containing the corresponding record identifier from Table 3

One field containing X co-ordinate data to plot the spot on the photograph to highlight the landmark

One field containing Y co-ordinate data to plot the spot on the photograph to highlight the landmark

Table 3 relates to the 'landmark' data

Each record contains:

A unique identifier

The landmark name (e.g. 'Clarks shoe Shop')

The corresponding record identifier from Table 2

Final direction instruction

Five fields of text description

A type descriptor for the landmark (e.g. 'Shoes')

Contact email address

Contact telephone number

Contact fax number

Postal address

Landmark graphic name (that is, name of view of Landmark)

Landmark button graphic name

Website address

The virtual street-walking pages are constructed from data held in Table 2 and Table 3. If a direction field (for example North, South East, West) is blank, no arrow is displayed for that direction, if it contains data, the arrow is displayed and the data contains the corresponding record identifier from Table 2 that is used to build the link for that direction.

The landmark icons are constructed in a similar fashion: Table 3 is scanned for records containing a pointer to the 'current' record in Table 2. Any records found to contain the pointer are used to construct the landmark link, display the appropriate button graphic, and embed the spot as a hidden layer at the correct co-ordinates on the photograph area of the page.

The landmark page is constructed entirely from data held in Table 3. Direction information can be requested from this display and is accessed from the corresponding record in Table 2 via the pointer held in the table 3 record.

The directions page is constructed from a Table 2 record, which contains pointers to the records held in Table 1 in the same sequence in which they are to be output to screen. The final direction is read from Table 3 using the current record in Table 2 and is inserted as the last instruction.

As indicated above, the system could also be used to assist navigation in other areas, such as within a building, for example a museum or house. The user could be presented with a room or floor plan and then with three-dimensional views for navigation purposes. This could also be provided for viewing purposes, for example to determine whether the view or display in a particular room or in a particular part of a room is of interest.

The Tables referred to above, which in practice are likely to be databases, can either be stored in the user carried device or could be located in a remote base station which communicates with the user portable device. Similarly, the system could be implemented solely on a static computer, preferably providing downloaded or printed results.

CLAIMS

1. A navigation system including a user device comprising a display, user input means for inputting data representative of a location co-ordinate and display generating means operable to generate on the display a three dimensional view of the environment indicated by inputted data.

2. A system according to claim 1, wherein the display generating means is operable to generate on the display a map or plan in addition to a three dimensional view.

3. A system according to claim 2, wherein the display means is operable to display a map or plan may at the same time as a three dimensional view or separately therefrom.

4. A system according to any preceding claim, wherein the display generating means is able to display data relating to addresses or other locations of interest of a desired destination and/or landmarks.

5. A system according to any preceding claim, wherein the three dimensional view is in the form of a photograph or photograph-like image.

6. A system according to any preceding claim, wherein the three dimensional view is in the form of a picture or drawing.

7. A system according to any preceding claim, including an orientation device and means to indicate on the display position and/or direction of travel.

8. A system according to any preceding claim, wherein the system is designed to provide written and/or oral directions.

9. A system according to any preceding claim, including a remote base unit at which map and/or view data is stored for transfer to the user device via a communications system.

10. A system according to claim 9, wherein the communications system is a cellular telephone system, radio signal communications system or satellite communications system.

11. A system according to any preceding claim, wherein the system is incorporated into a portable telephone, a navigation system in a vehicle or in a personal computer or similar device.

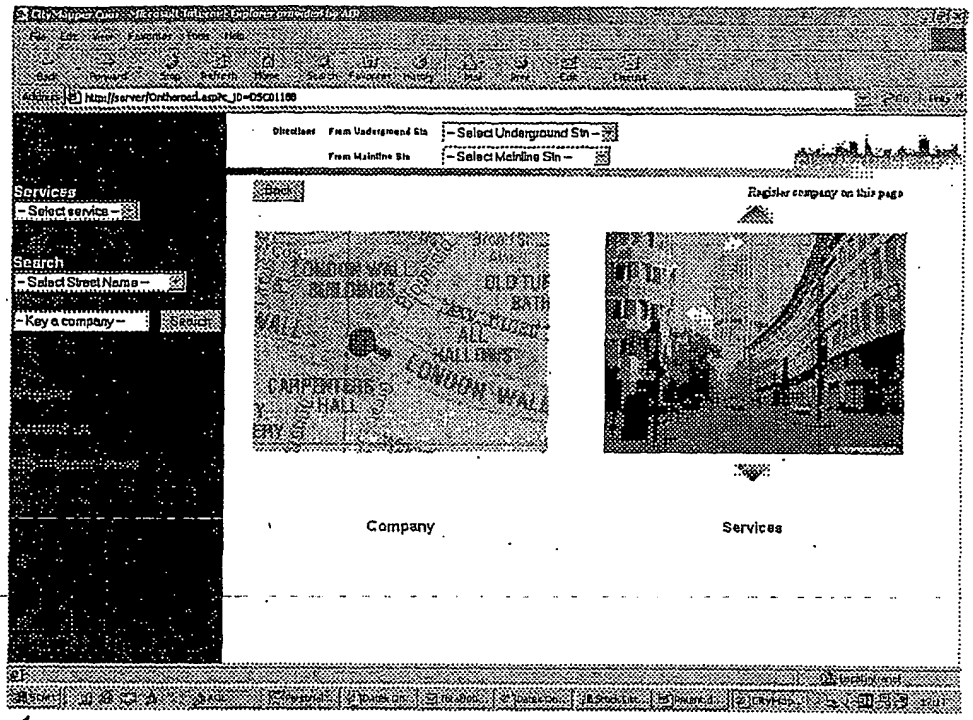

Figure 1a

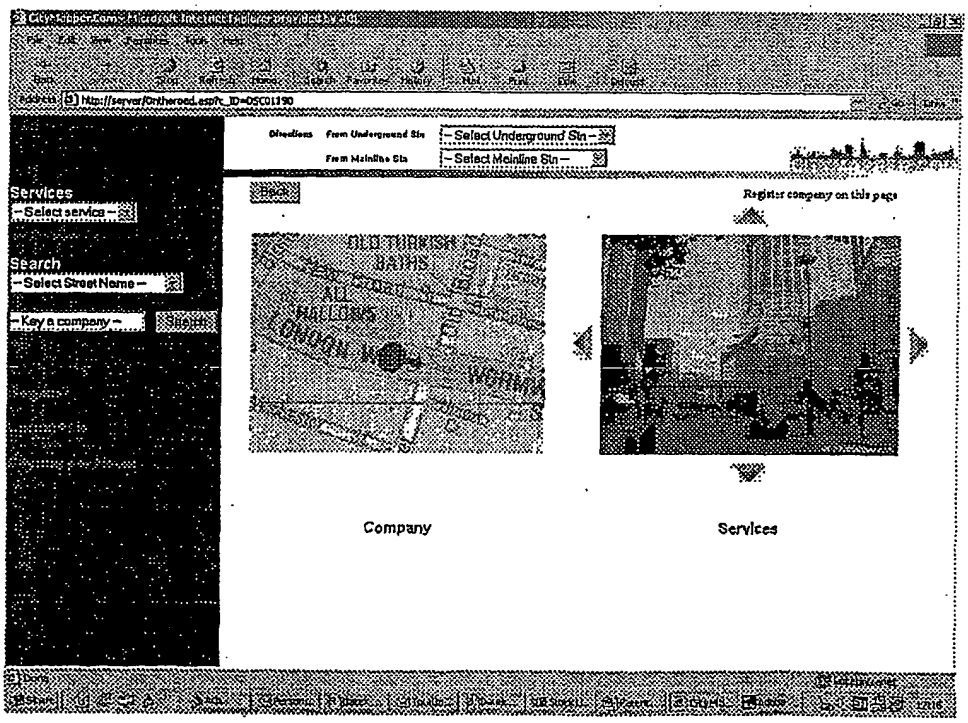

Figure 1b

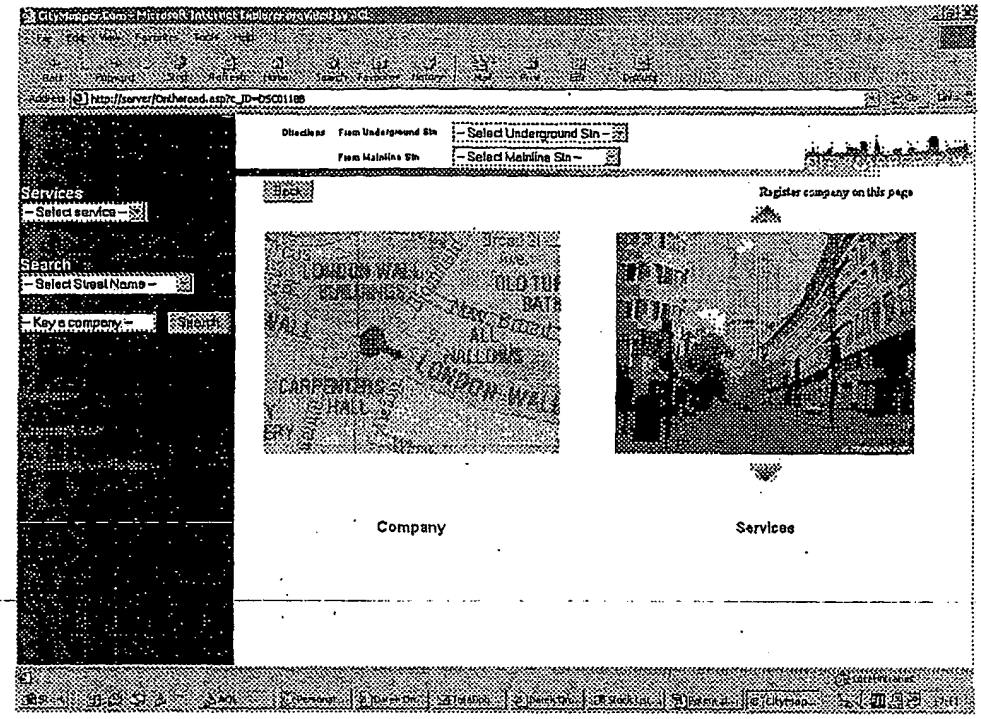

Figure 2a

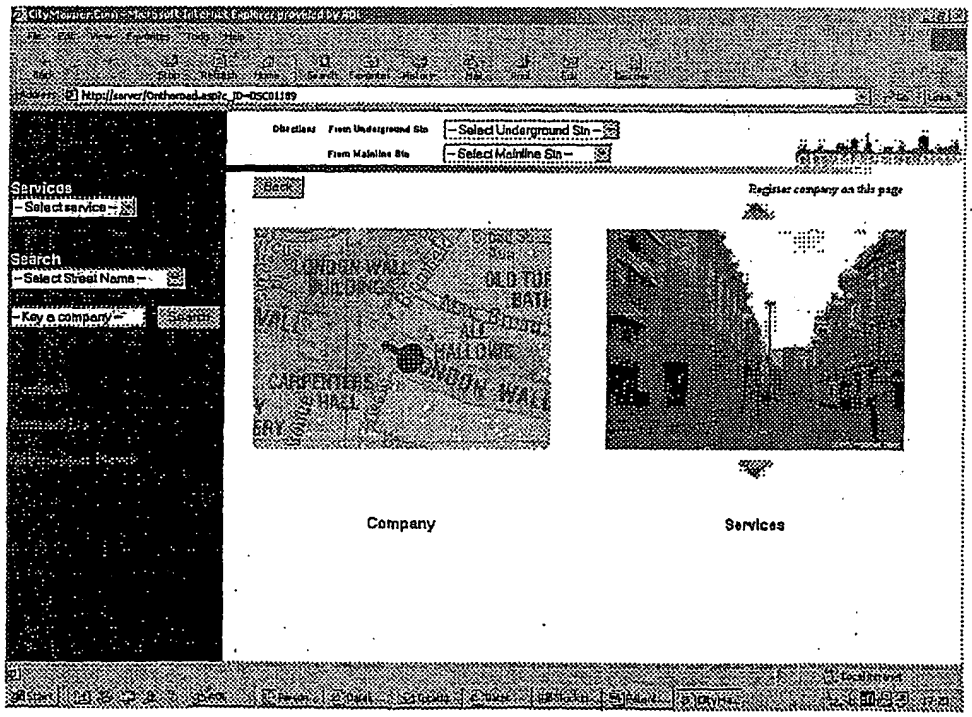

Figure 2b

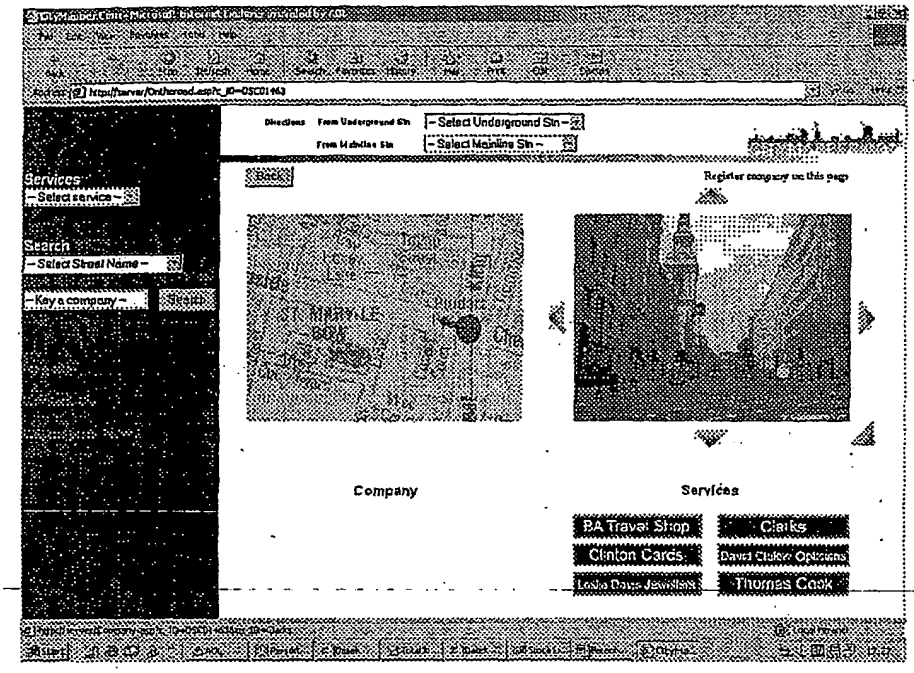

Figure 3a

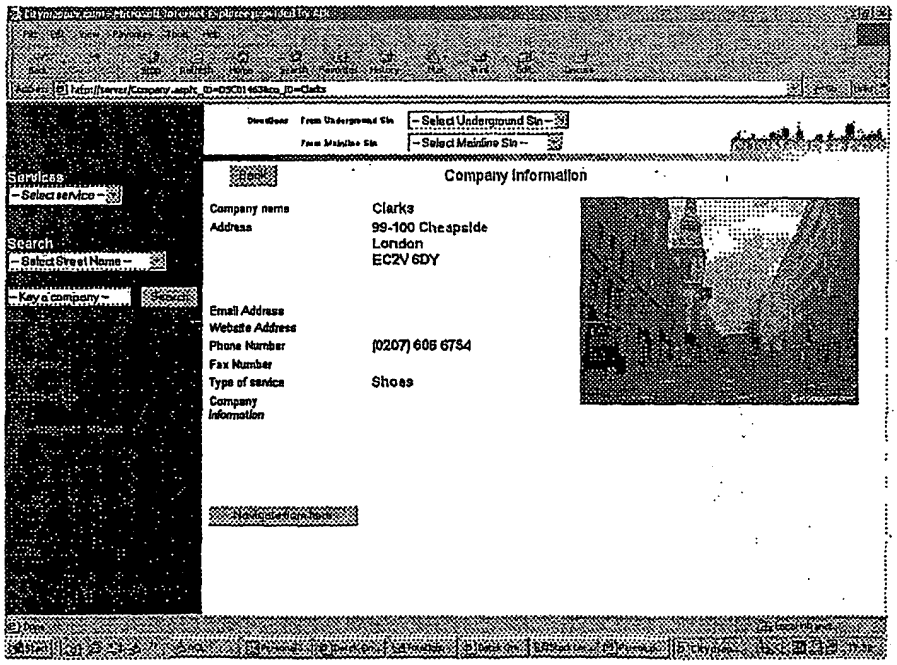

Figure 3b

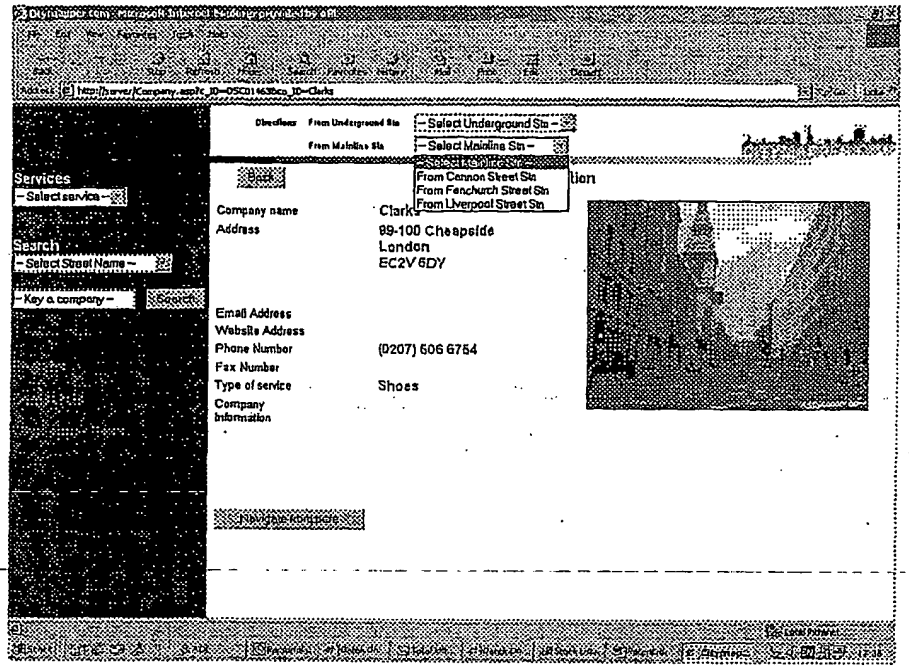

Figure 4a

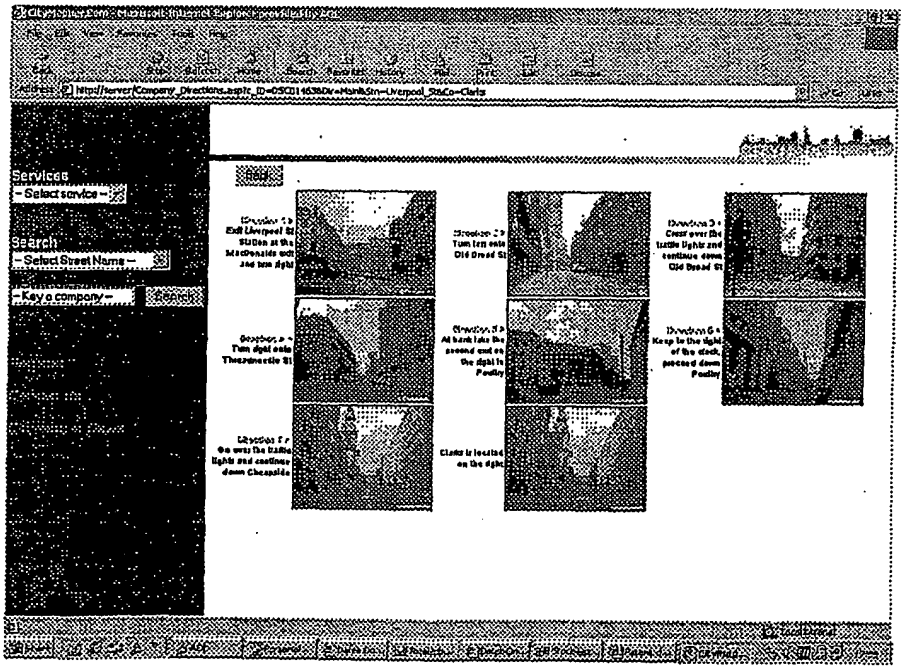

Figure 4b

INTERNATIONAL SEARCH REPORT

Int Application No
PCT/GB 02/00233

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 G01C21/20 G09B29/10

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 G01C G09B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
WPI Data, PAJ, EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 6 148 261 A (DINKEL JOHN ET AL) 14 November 2000 (2000-11-14) abstract column 2, line 37 -column 3, line 17 column 4, line 13 - line 25 column 7, line 42 - line 43 column 9, line 63 -column 10, line 1 column 16, line 24 - line 40; figures	1-11
X	EP 1 024 347 A (IBM) 2 August 2000 (2000-08-02) abstract column 7, line 30 - line 42 column 8, line 12 - line 17 column 9, line 24 - line 43	1-3,5,7, 9-11

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[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

° Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
26 April 2002	08/05/2002

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Hoekstra, F

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INTERNATIONAL SEARCH REPORT

Application No
PCT/GB 02/00233

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	PATENT ABSTRACTS OF JAPAN vol. 2000, no. 07, 29 September 2000 (2000-09-29) -& JP 2000 101999 A (HITACHI INFORMATION SYSTEMS LTD), 7 April 2000 (2000-04-07) abstract; figures	1,5

2

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INTERNATIONAL SEARCH REPORT

...nation on patent family members

In ... l Application No
PCT/GB 02/00233

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JP 2000101999	A	07-04-2000	NONE		